10-20 EEGs After One Hour of Training Using a Disposable EEG Electrode Cap

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Abstract:

Qualified EEG technologists are in short supply and the time required to teach an individual how to measure, mark, and apply EEG electrodes is very time intensive (Torres and Butter, 1996). This study investigates the use of the CortiCap by users with no experience in EEG setups. The CortiCap is a premeasured lead set with a full 10-20 electrodes array (23 electrodes) including an independent reference and ground. This study determines if an hour of one-on-one standardized training on the CortiCap with a trainer, that is an R.EEG T. and product expert, is adequate for five individuals with no previous EEG training to successfully apply a full 10-20 electrode array, provided three attempts on the same individual. All five participants (Services manager, Human Resources, Operations Manager, VP of Sales, and Attorney) completed the one hour of standardized training and were successful in completing each of the three applications without assistance with proper placement and impedances less than 10K ohms. The mean for participants to complete their first attempt was 16:33min:sec and their third attempt was 11:04min:sec (Table 1). All five participants were successful with their first independent application of a full 10-20 EEG setup after an hour of training, and they reduced the time to complete the application on the third attempt compared to the first attempt by a mean of 33%(Graph 2).

Methods:

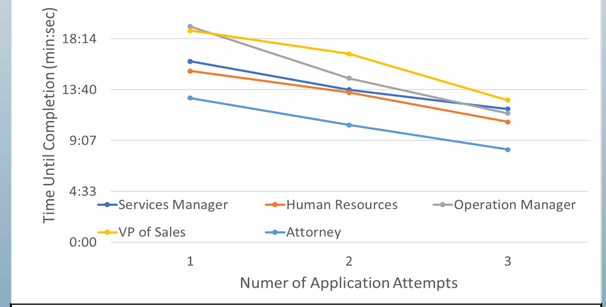
All participants were given one hour of one-on-one training with a standardized approach. All participants watched a 5-minute instructional video. Following the video, they were presented the physical supplies and encouraged to ask questions about all aspects of the CortiCap setup. Each participant was then shown how to apply the CortiCap to the subject with proper placement, prep an electrode, and connect the CortiCap to an EEG headbox. Then each participant was directed to apply the CortiCap and prep as many electrodes as time would allow within the 1 hour time period. Feedback on the participant's technique was provided for each electrode as well as answers to any questions or observations. All participants used 4 (four) CortiCaps, and associated supplies (Elefix, Waveprep, cotton tip applicators), and a Natus EEG hardware/ software system. The participants were made up of working professionals with no EEG training. The participants' professions included Attorney, Human Resources, Operations Manager, Services Manager, and VP of Sales. All the participants were immediately asked to attempt three applications resulting in proper placement, all impedances less than 10k ohms, and good signal quality all on the same practice patient. The time was stopped once all criteria were satisfied. All participants used the same practice patient with a head circumference of 57cm and a hair length of 6cm at its height. The trainer was tasked with the evaluation of the placement of the electrodes, the quality of the EEG recording, and the time to complete each attempt.

PARTICIPANTS	1st Attempt	2nd Attempt	3rd Attempt
Services Manager	16:13	13:41	11:57
Human Resources	15:21	13:26	10:47
Operation Manager	19:21	14:42	11:33
VP of Sales	18:58	16:53	12:44
Attorney	12:56	10:31	8:19
Mean	16:33	13:50	11:04

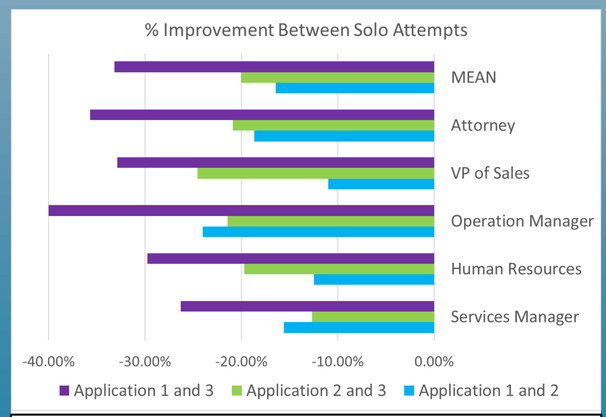
Table 1: Show the time each participant took to properly place the CortiCap, achieve 10K ohms, and good EEG quality on all CortiCap EEG electrodes after one hour of training. The times are in minutes and seconds.

Results:

All participants successfully completed three CortiCap applications without assistance. Each of the participants demonstrated improvement between the first and the third attempt. The mean time to completion on the first attempt of all five participants was 16:33 min/sec, the mean for the second attempt took 13:50 min/sec, and the mean on the third attempt took 11:04 min/sec (Table 1). Graph 1 shows this data as a line graph. The participants observed a 16% mean reduction in time to completion between the first and the second application attempt, a 20% reduction in time to completion between the second and third application attempt and a 33% reduction in between the first and third application attempts (Graph 2). Upon completion of all application attempts the R.EEG T. / product expert evaluated each EEG sample and determined all EEG samples to be of good quality, and free of nonphysiological artifact (Figure 1).



Graph 1: Shows the progress of each participant and after each of the three attempts over time after one hour of training.



Graph 2: Details the percentage of improvement each participant obtained between each of there attempts with respect to time.

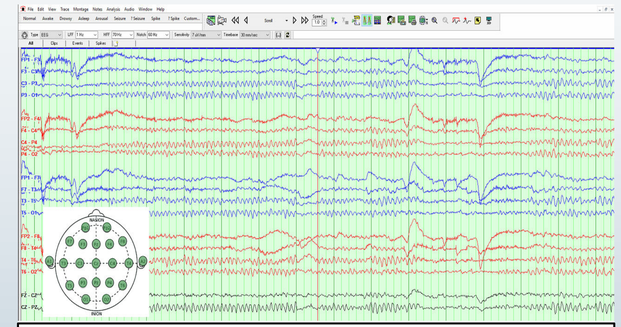


Figure 1: Displays an EEG sample of the Operations Manager 1st attempt. All impedances were less than 10k Ohms as indicated in the bottom lefthand corner and properly placed.

Conclusion:

With one hour of one-on-one standardized training on the CortiCap it is possible to have non-clinicians successfully and accurately apply a quality 10-20 EEG setup achieving impedances of less than 10k ohms. By decreasing the time required to train an individual with no previous EEG experience to apply a standard electrode array with a premeasured lead set more facilities can provide EEG recordings when a formally trained EEG technologist is not available (McKay, 2019). With reduced training requirements more health care professionals can be trained, addressing the staffing challenges the industry faces from an increase in demand for EEG services.

References:

Roberto E. Torres & Irene H. Butter (1996) The Impact of EEG Technology on Health Manpower, American Journal of Electroneurodiagnostic Technology, 36:2, 114-132, DOI: 10.1080/1086508X.1996.11080544

McKay JH, Feyissa AM, Sener U, D'Souza C, Smelick C, Spaulding A, Yelvington K, Tatum WO. Time Is Brain: The Use of EEG Electrode Caps to Rapidly Diagnose Nonconvulsive Status Epilepticus. J Clin Neurophysiol. 2019 Nov;36(6):460-466.